HULL AND CARGO SURVEYORS, INC.
MARINE SURVEYORS AND CONSULTANTS
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TWX NO. 9103826002, ANS BK HCSI SFO RCMD
TEL. (415) 524-4402

JULY 19, 1985

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STABILITY ANALYSIS
****

SS WAPAMA

BARGE "214"

On July 15, 1985 and subsequent dates, the following analyses were made for the steam schooner "WAPAMA" as cradled aboard the barge "214". Lacking drawings for the hull lines and offsets for the "WAPAMA", estimates have been made for the various criteria. It is felt that displacement as determined from barge draft is accurate. However, Vertical Center of Gravity, (VCG) is estimated and may be in error by about 10%. This and other estimated values should not affect the results in any significant manner. That is, the righting arms, heeling arms and "GM" should be well within the limits of error that might change the stability limits of the combination of barge and vessel. Wind heeling arms are also predicated on estimates of vessel exposed area. Again, values used are conservative and results are felt to be accurate within any conditions foreseen in the mooring areas.

CRITERIA:

BARGE 214: - As determined from attached drawings from Crowley Maritime Corporation.

SS WAPAMA: - Length overall, Beam, Molded depth and operating drafts as quoted by the National Park Service.

In addition to above values, displacement of "WAPAMA" as found aboard the barge has been determined by draft survey of barge as found afloat.

It is noted that damage to barge bottom may have changed the displacement as determined from lines plan and draft. This is not felt to be significant and has been ignored in the calculations.

WAVE CONDITIONS:

A maximum assumed sea spectra at any mooring area has little or no effect on stability calculations. A worst case situation might give one to three foot waves at the mooring. However, if it were to be assumed that the barge and vessel were to be directly exposed to swell effects coming through the Golden Gate, it would be necessary to look at motion loadings to the cradles securing "WAPAMA" aboard the barge.

It is felt that no special precautions need be taken with vessel in a mooring situation. However, if vessel is to be towed in relatively open water, further examination should be made to ensure integrity of fastenings and before moving, weather forecast should be obtained to minimize exposure.

RESULTS:

In an undamaged condition, the barge has a maximum righting arm of seven feet at about 15 degrees of heel. With a total displacement of 1,860 short tons, this gives a righting moment of 13,000 foot tons. The down flooding angle is noted at about 14 degrees in this condition. Wind heeling moment is:

50 knots----------1750 foot tons

70 knots----------3430 foot tons

90 knots----------5670 foot tons

From the righting arm curve, it can be seen that the 90 knot heeling moment is equaled at about 5.5 degrees. Since deck edge does not submerge until about 14 degrees, this is felt to be adequate. However, it should be noted that the lateral force at this wind speed would be largely applied through the cradle and a further examination for adequate strength here should be made.

For one compartment damaged, the number 2 tank was chosen. Since the longitudinal bulkhead is penetrated for cross flooding, no change in angle of heel is expected. This is felt to be a correct decision since heel is more critical than trim or flotation.

Analysis shows that (by lost flotation method) the barge would develop an average draft of 7.1 feet with #2 completely flooded. The trim by the bow would be 8.4 feet giving a bow draft of 11.3 feet - stern 2.9 feet.

By added weight method (530 short tons of water in #2) a stability analysis shows adequate righting arm in a still water condition. The maximum arm is about 5 feet at a heel of 15 degrees. However, the down flooding angle is now less than five degrees and a free surface effect of the flooded tank further reduces static stability.

The free surface effect can be considered as two separate tanks since the longitudinal bulkhead now acts as a swash bulkhead. The reduction in GM for this effect is 2.6 feet leaving a static GM of 25.2 feet. This effectively reduces the righting arm curve by 10 % leaving a maximum righting arm of about 4.5 feet. It also changes the point of maximum righting arm to about 12.5 degrees.

Given all the above, it can be seen that holing this tank would produce a very serious situation. The trim alone

puts the deck edge very close to the water line and the free surface effect will put the vessel in danger of down flooding before any wind heeling is considered. If there is any wind, the deck edge and consequently any open or leaking hatches would immediately sink the barge. The residual righting moment is still greater than the wind heeling moment but it is conceivable that a rolling motion could develop which would be aggravated by the free surface effect and push the barge over the top of the curve, allowing the whole unit to overturn.

RECOMMENDATIONS:

Testing has shown that compartments are reasonably air-tight. The simplest method to ensure that wastage or accidental penetration do not allow flooding is to rework hatch covers for a good seal; install permanent fixtures in tanks (not hatch covers) for connection to a nitrogen pressure system limited to 3 PSI and connect in a flow alarm to give warning when nitrogen is being injected into a tank. This would serve two purposes. The over-pressure of the nitrogen would prohibit water penetration and the flow warning would alert personnel to find the leak. In addition, if the leak is below water, the bubbles would show a diver where to put a temporary patch.

The system can be made as simple or elaborate as desired. It would be possible to have a flow alarm for each tank or just one for the whole barge. Nitrogen purging the tanks would also arrest further internal corrosion. However, just sealing the tanks from further atmosphere penetration will help the corrosion problem. There will probably be some leakage from tanks even after rework of hatches. The flow alarm would have to be set at some level slightly greater than the normal leakage rate. To make the system more fool-proof, it would be necessary to add a low pressure alarm on the main supply cylinder to give warning to change the cylinder.

SUMMARY:

Barge has adequate stability for foreseeable conditions in it's undamaged state. A loss of one compartment would produce an unacceptable margin of stability. It should be possible to install a combination protection and alarm system to reduce the possibility of flooding a compartment when the vessel is unattended.

It is felt that the system as it exists is adequate for a moored state. However, further examination of cradle and/or fastenings is recommended if vessel is to be towed in relatively open waters.

BARGE "214" AND "S/S WAPAMA"

UNDAMAGED STABILITY
****

```
                XEQ "STAB"
BOW-S=1,R=2
                  2.0    RUN
LENGTH
                200.0    RUN
BEAM
                 60.0    RUN
DEPTH
                 12.0    RUN
D.R.
                  1.5    RUN
D.R. WIDTH
                  1.5    RUN
RAKE
                 18.0    RUN
LOG
                  2.5    RUN
L.S. DRAFT
                  1.5    RUN
DISP?
                460.0    RUN
L.S. DISP. 460.0 S.T.
L.S. GM 207.4
LOAD DRAFT?
                 5.65    RUN
LOAD 1 S.T.
                 1400    RUN
VCG
                  20.    RUN
LCG
                   0.    RUN
LOAD 2 S.T.
                    0    RUN
VCGC=20.00
LOAD 1,400.00 S.T.
DRAFT 5.65
DISP. 1,860.00 S.T.
LCGC=0.00
KG=25.57
                     XEQ D
GM=34.74
```

```
HEEL 5.0
R.A.=2.7

HEEL 10.0
R.A.=5.4

DOWNFLOOD 4

HEEL 15.0
R.A.=7.0

HEEL 20.0
R.A.=6.3

HEEL 25.0
R.A.=4.8

HEEL 30.0
R.A.=3.0

HEEL 35.0
R.A.=1.1

HEEL 40.0
R.A.=-1.0
```

```
      PLOT OF GZ
   X (UNITS= 1.) ↓
   Y (UNITS= 1.) →
    -1.00        7.00
     0.00
    |--|-------------|
 0.0  x
 5.0  |     x
10.0  |          x
15.0  |             x
20.0  |            x
25.0  |        x
30.0  |    x
35.0  |  x
40.0  x  |
```

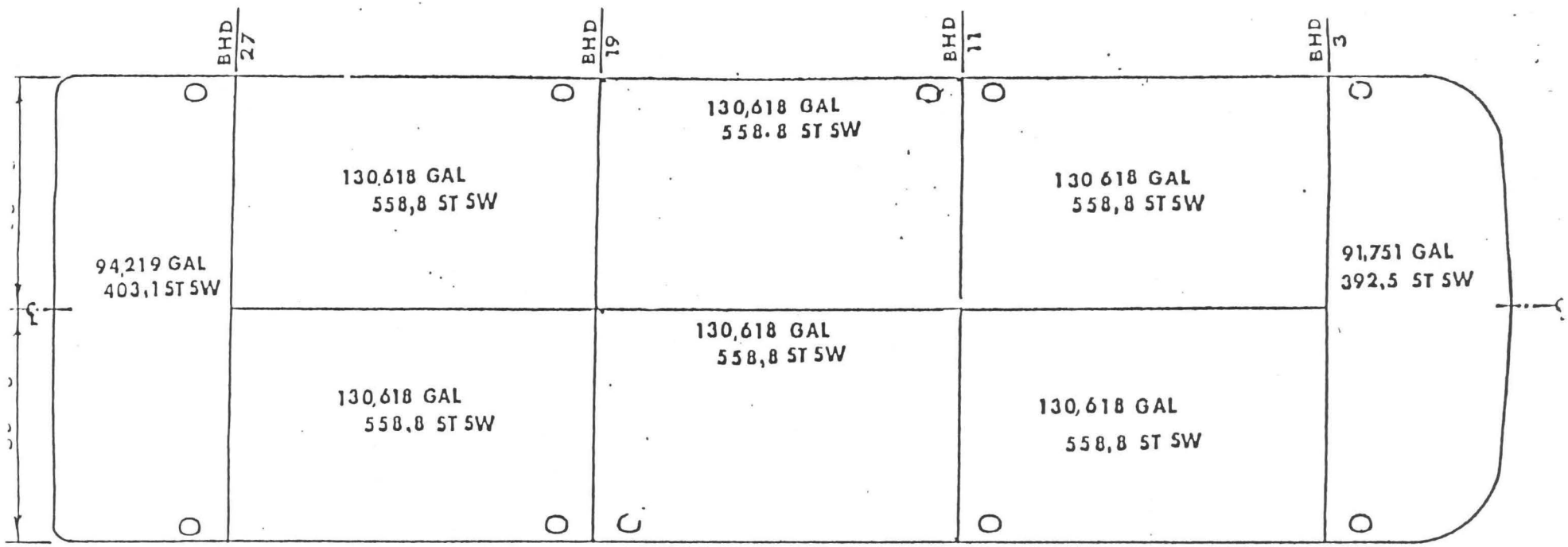
ONE COMPARTMENT DAMAGED
****

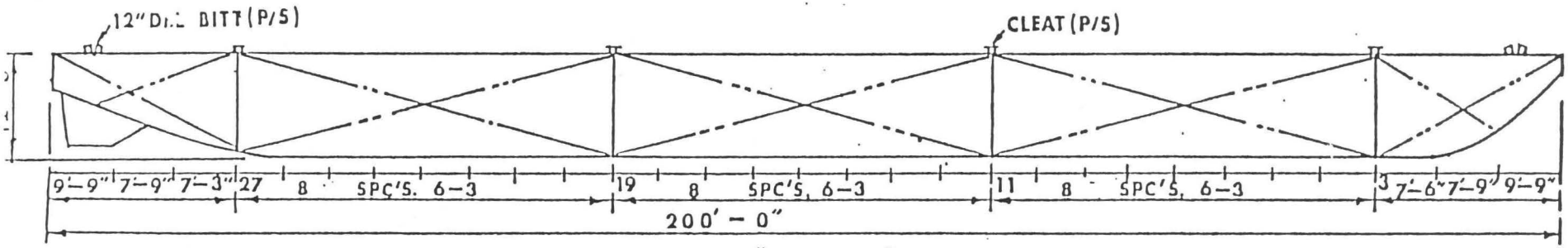
```
                XEQ "STAB"
BOW-S=1,R=2
                  2.     RUN
LENGTH
                200.0    RUN
BEAM
                 60.0    RUN
DEPTH
                 12.0    RUN
D.R.
                  1.5    RUN
D.R. WIDTH
                  1.5    RUN
RAKE
                 18.0    RUN
LOG
                  2.5    RUN
L.S. DRAFT
                  1.5    RUN
DISP?
                460.0    RUN
L.S. DISP. 460.0 S.T.
L.S. GM 207.4
LOAD DRAFT?
                  7.1    RUN
LOAD 1 S.T.
                 1400    RUN
VCG
                   20.   RUN
LCG
                    0.   RUN
LOAD 2 S.T.
                  530    RUN
VCG
                -3.55    RUN
LCG
                   50.   RUN
LOAD 3 S.T.
                    0    RUN
VCGC=13.53
LOAD 1,930.00 S.T.
DRAFT 7.10
DISP. 2,390.00 S.T.
LCGC=13.73
KG=21.77
                     XEQ D
GM=27.85
```

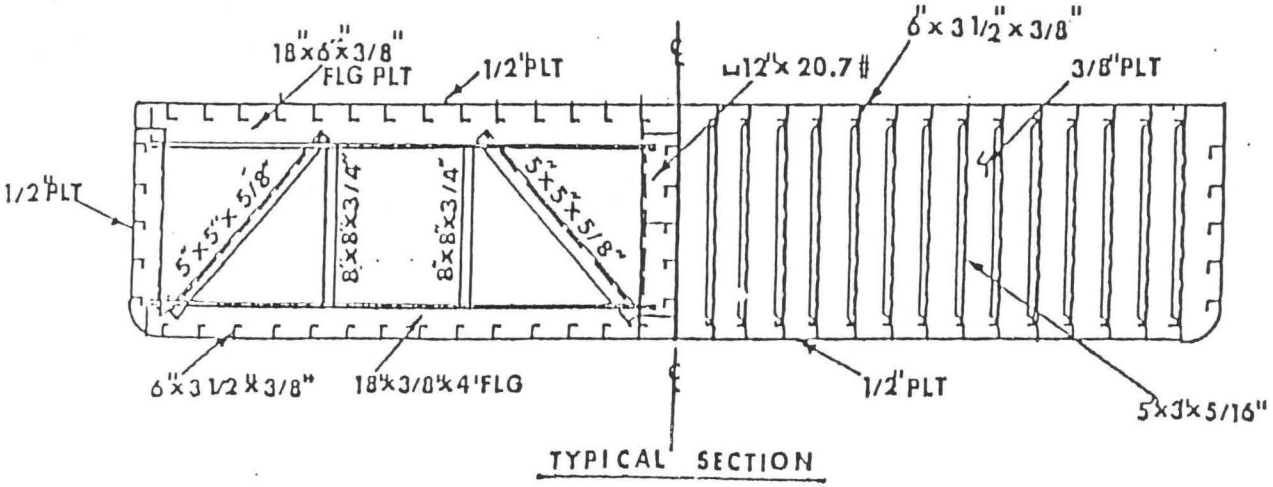
```
HEEL 5.0
R.A.=2.1

HEEL 10.0
R.A.=4.3

HEEL 15.0
R.A.=5.1

HEEL 20.0
R.A.=4.6

HEEL 25.0
R.A.=3.4

HEEL 30.0
R.A.=2.0

HEEL 35.0
R.A.=0.4

HEEL 40.0
R.A.=-1.2
```

```
      PLOT OF GZ
   X (UNITS= 1.) ↓
   Y (UNITS= 1.) →
    -2.00        6.00
      0.00
    |----|-------------|
 0.0    x
 5.0    |    x
10.0    |         x
15.0    |           x
20.0    |          x
25.0    |       x
30.0    |   x
35.0    |x
40.0  x |
```

```
L.S. LCG
                 0.00    RUN
LCB
                 0.00    RUN
TRIM=0.37 FT.
LBP
               200.00    RUN
LCF
                 0.00    RUN
FWD 11.28
AFT 2.92
```







TYPICAL SECTION

CROWLEY MARITIME CORP.
200' x 60' x 12'
214 215 216 & 217
DRAWN: Cho S. DATE: 6/16/77

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SAN JUAN, P.R.

July 19, 1985

NATIONAL PARK SERVICE
Fort Mason #201
San Francisco, CA 94123

Attn: S. Hastings

RE: Barge 214

Dear Steve,

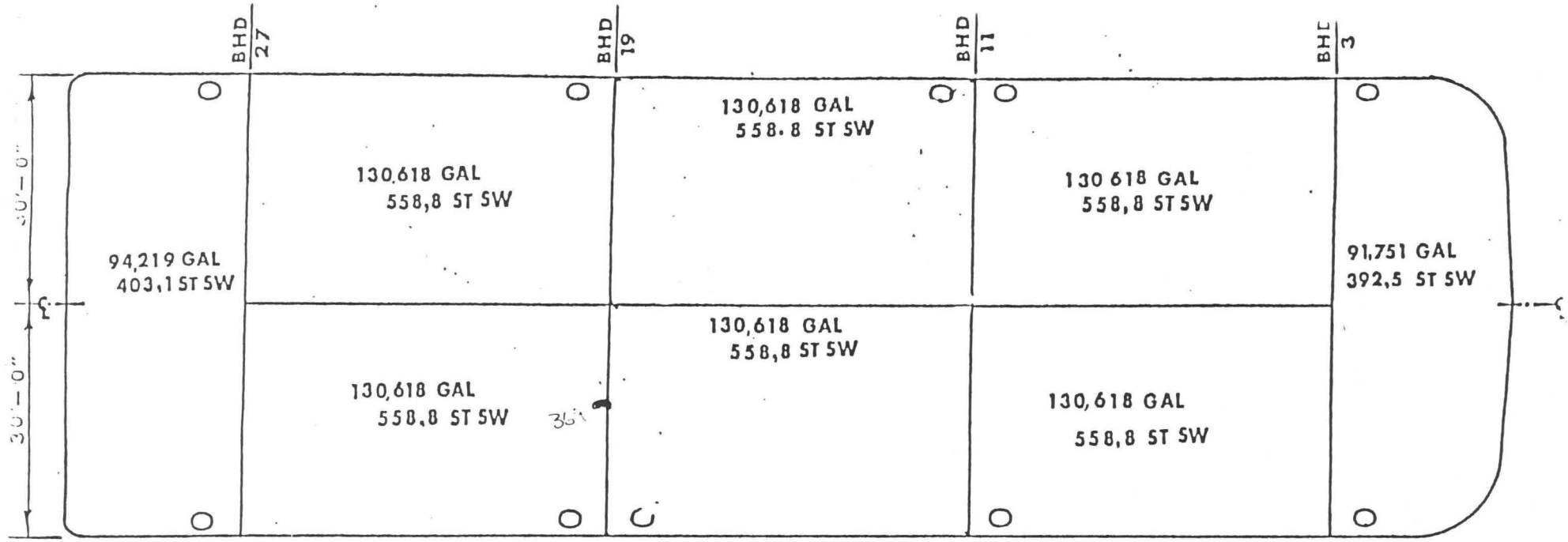
Enclosed please find our report of condition. Upon your review and direction proposed write up of specification will be undertaken. Stability and Wind Load Calculations are fourth coming.

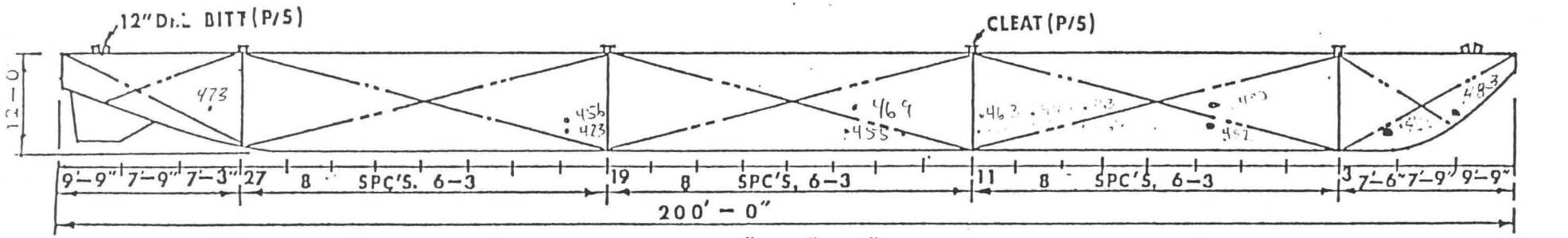
Very truly yours,

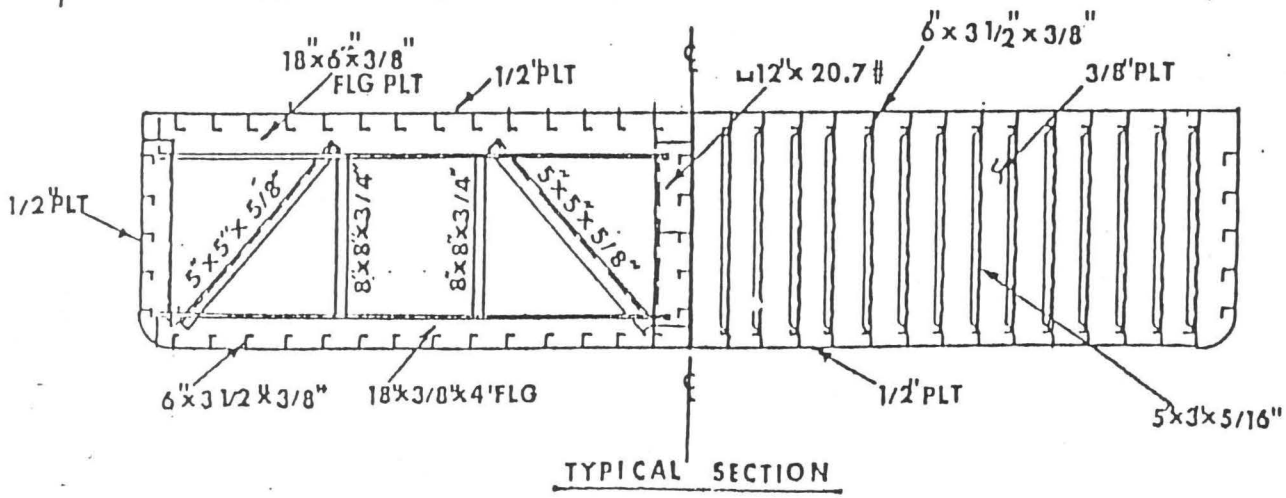
Bruce Cibley
Marine Surveyor

BC/kc

encl







TYPICAL SECTION

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200' x 60' x 12'
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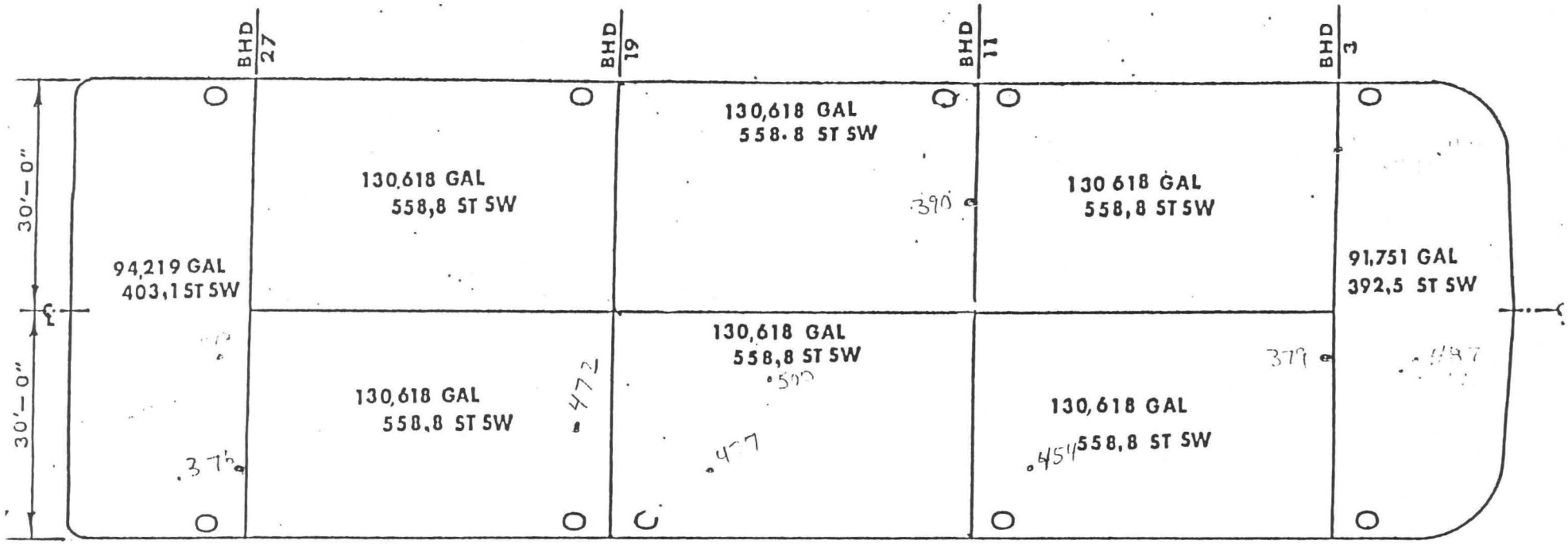
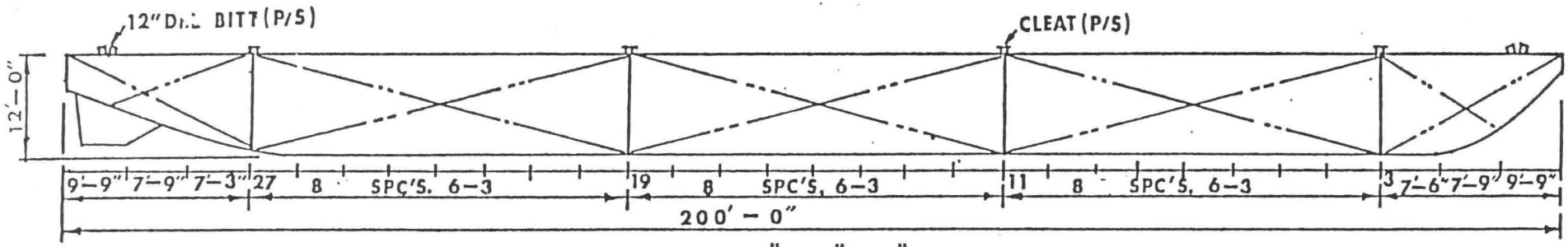
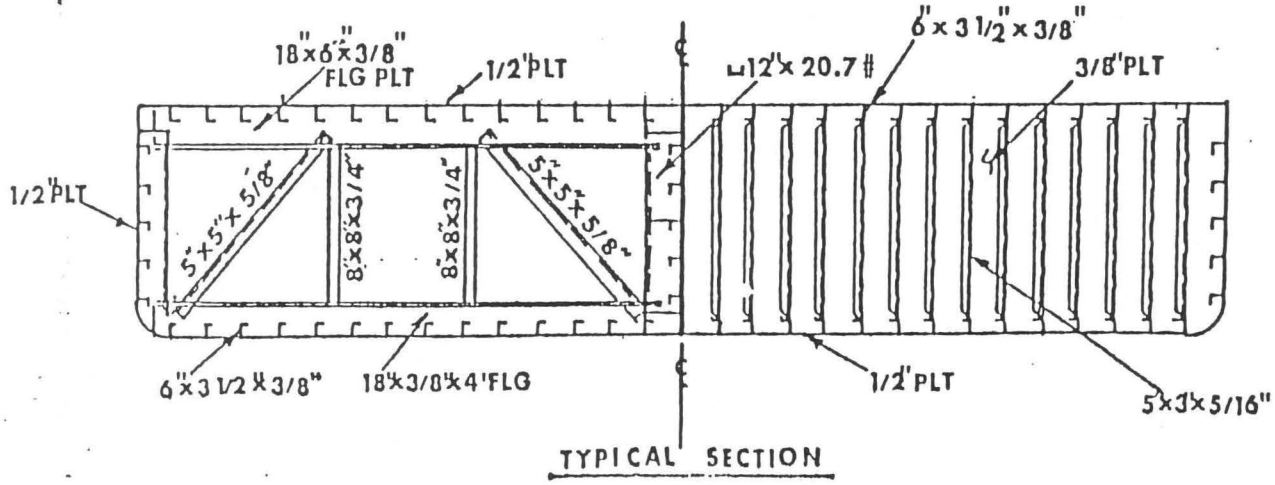
INTERIOR SIDE SHELL PORT STBD







TYPICAL SECTION

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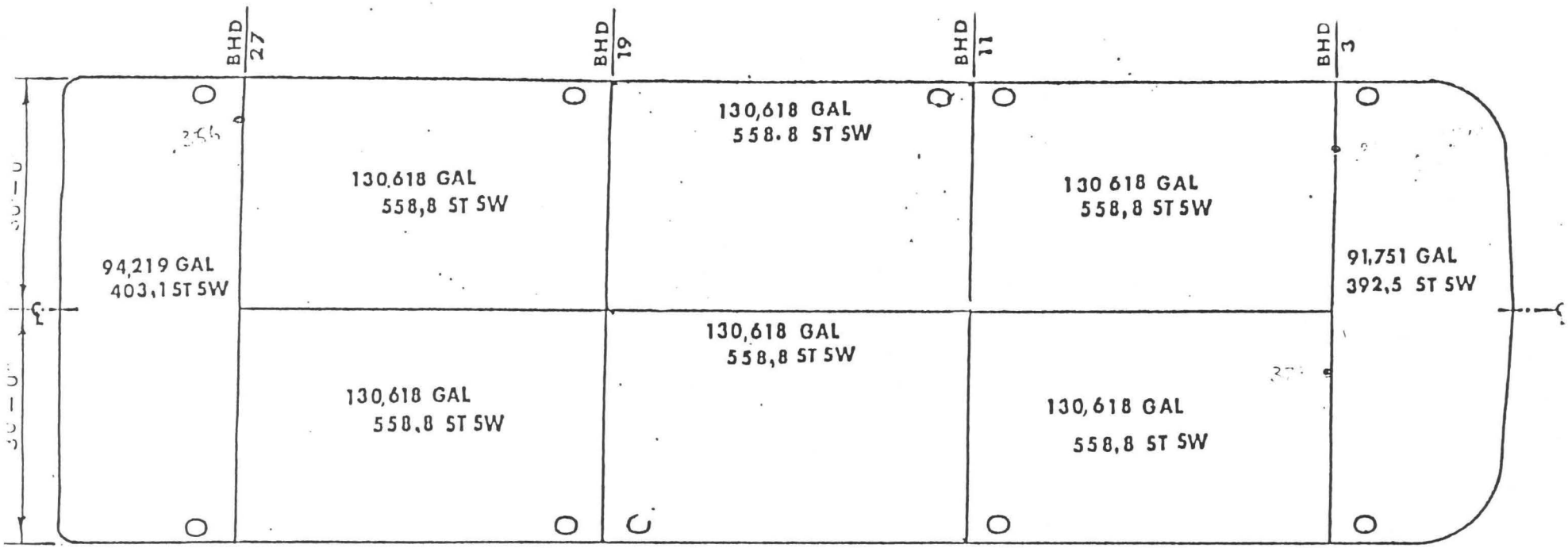
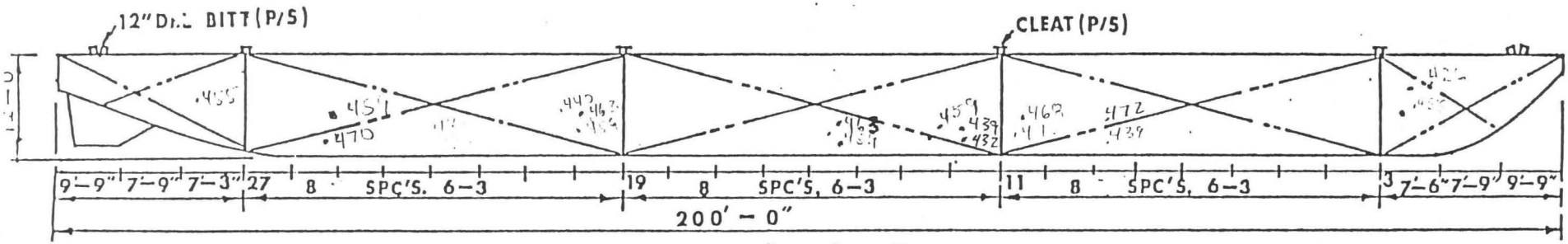
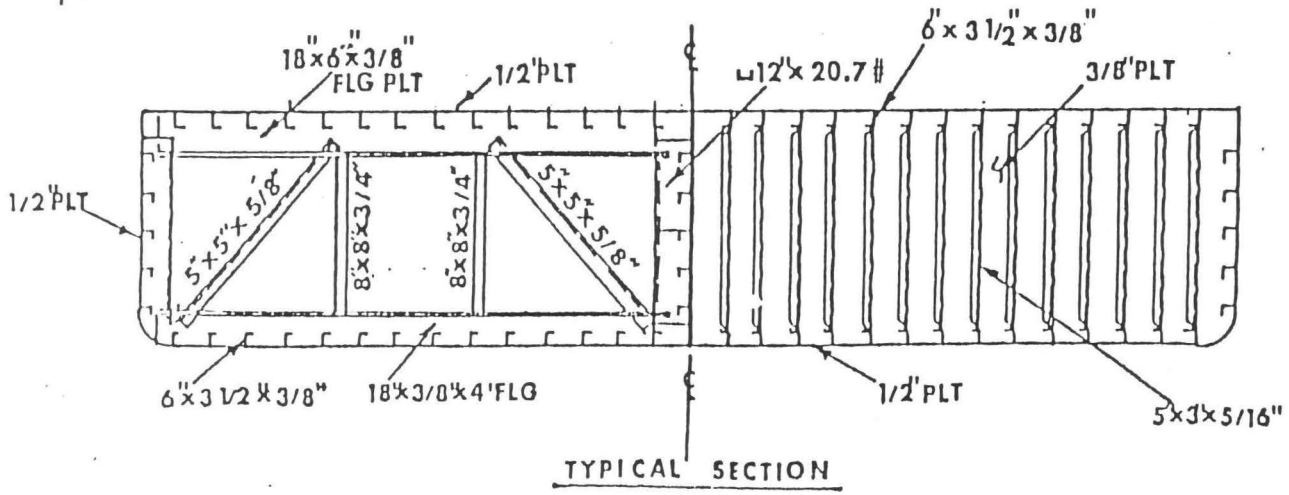
INTERIOR
BOTTOM PLATE







TYPICAL SECTION

CROWLEY MARITIME CORP.
200' x 60' x 12'
214 215 216 & 217
DRAWN: Cho K. DATE: 6/16/77

INTERIOR SIDE SHELL PORT

HULL AND CARGO SURVEYORS, INC.

SURVEYORS

HULL  CARGO

INC.

FILE NUMBER SFH 85129

RE: Reference 8140-85-Q-0022
Barge 214 Report
of Condition.
Survey at Merit Ship
Repair and Dry Dock Oakland
CA, on date 5-31-85
and subsequent dates.

TO: Department of Interior
National Park Service
Golden Gate National Recreation Area
Fort Mason, Bldg. 201
San Francisco, CA 94123

ATTN: Mr. Steve Hastings

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AT THE REQUEST OF

Mr. Steven Hastings, Director, Hyde St. Pier, the undersigned Marine Surveyor did conduct a condition survey as outline in the statement of work submitted to us by Mr. Hastings.

SURVEYORS NOTE

A. Internal members numbered top to bottom FWD to AFT, outboard to inboard.

B. Where side or bottom shell plate longitudinal frames are noted as bowed the plate is also set in. Thus, the side shell plate is not always mentioned.

C. This report is limited to items set in or distorted more than 1 (one) inch.

D. Bow and stern rakes are designated as such with tanks numbered 1-3 P/S.

PARTICULARS

Vessel Name	Barge 214
Built	1970 Jeffersonville, IND.
Owner	Bay Cities Transportation
Operator	Puget Sound Tug & Barge Co.
Offical #	524 573 Net gross 1255
Classed	A.B.S. A-1 Maltese Cross
A.B.S. Load line certificate	61-24138-2 3-20-80
Registered Dimensions	
LOA 199'.96"	Beam 60'.08"-Depth 11'.5"

Vessel is all welded steel construction with raked bow and stern skegs. Vessel is common access in the bow and stern rakes with a longitudinal bulkhead fitted centerline between tanks 1-3. Holes 2 per tank, have been cut in this bulkhead affording access to port and starboard tanks 1-3.

BOW RAKE PORT

1) #1 vertical side shell bracket from head log is waved and distorted. Shell plate in way of bracket is inset in a 12" x 18"x2" area.

2) Between vertical side shell brackets 1 and 2 the rake knuckle is distorted in a 27x41x3" area.

3) Between vertical side shell brackets 2 and 3, shell plate is inset from deck seam through bounding bar in a 43x24x4" area.

4) Between vertical side shell brackets 2 and 3, a 18x18x1½" inset located at the rake knuckle to bottom plate seam.

5) Vertical side shell bracket #3 is buckled in web at side shell plate in a 6x6x½" area.

6) #1 side shell frame is waved and buckled from bottom up 42" and buckled 9".

7) Between side shell frames 1 and 2 vertical stiffener is tripped and distored from top of stiffener down 2 ft.

8) Between side shell frames 1 and 2, bounding bar is inset 1".

9) Between side shell frame 2 and first vertical stiffener forward of frame #2. Longitudinal #3 is inset 2" for a length of 31".

10) Located 5½ feet forward of bottom frame #1. Between bottom longitudinals 2 and 3 as counted from side shell. A 33x20x2" deep inset noted. #3 bottom longitudinal is tripped adjacent to effected area.

11) Located 5½ ft. forward of bottom frame #1 between bottom longitudinals 3 and 4 as counted from side shell, a 66"x20x3" inset noted.

12) Between head log and frame #1, deck longitudinal 14 as counted from side shell a fracture in weld was found, located forward of diagonal 5" from head log. Vertical head log stiffener 14 is waved and distorted its length.

STARBOARD RAKE

13) Between head log and frame #1, between bottom longitudinals 3 and 4. Bottom shell plate 77x25x3" inset noted. Bottom longitudinal #3 is tripped and distorted from frame #1 forward 5 feet.

14) From approximately 6 feet forward of frame 1 located between bottom longitudinal frames 2 and 3, a 77x25x2" inset in bottom shell plate.

15) Between head log and frame 1 located between bottom longitudinal frames 1 and 2, shell plate is inset 77"x25"x3".

16) Between side shell vertical brackets 2 and 3 #1 bottom longitudinal is tripped a distance of 37".

17) Between head log and first vertical side shell bracket, bottom shell plate is inset 18x18x3" located 6" below corner wrap lower seam.

18) Between side shell vertical brackets 2 and 3, a inset of 31x13x4" located in rake knuckle.

19) In way of side shell vertical bracket 3. Vertical stiffener is waved and distorted 12", web of bracket 3 lightly distorted.

20) Between frames 2 and 3 , side shell longitudinals 1 and 2 bowed their length of frame space, inset approximately 2".

21) Between frames 2 and 3 first vertical bracket at side shell is buckled in web 18x24x2", second vertical bracket moderately waved, mid length.

22) Between frames 2 and 3, side shell longitudinal 3 is bowed 2" from frame 3 forward 30".

23) Between frames 1 and 2, a inset of 30x20x2½ located between side shell lonitudinals 1 and 2.

24) Between frame 2 and bulkhead 3, longitudinal frames 1-4 moderately bowed associated shell plate inset 1", bulkhead brackets 2 and 3 moderately waved.

25) Between frame 2 and bulkhead 3, bottom not surveyed due to 2" and 3" of water, 6" to 8" mud and silt.

26) Flange of frame 2 is light to moderately distorted between bottom longitudinals 2-6.

27) On bulkhead 3, #8 vertical stiffener is tripped form bottom bracket up 24" . Bottom bracket 8 moderately waved and distorted.

STARBOARD 1 TANK

28) All bottom longitudinals and frames heavily bowed, bottom plate set up 3" to 4".

29) Between bulkhead 3 and frame 4 side shell longitudinal frames 1-3 moderately bowed. Bulkhead bracket 1 moderately waved and distorted.

30) Bottom frame 4 moderately distorted its length previously released and rewelded.

31) Deck frame 4 is moderately distorted in flange in way of deck longitudinal 5.

32) Bottom frame 4 is fractured at longitudinal bulkhead.

33) Bottom frame 5 is moderately distorted between longitudinals 9 and 10.

34) Deck frame 5 is moderately distorted, flange buckled between deck longitudinals 5 and 6.

35) Bottom frame 5 is moderately waved and distorted its length.

36) Between frames 4 & 5, side shell longitudinals 1-5 and associated shell plate is lightly bowed.

37) Between frames 5 & 6, all side shell longitudinals light to moderately bowed.

38) Between frames 5 & 6, side longitudinal #2 is fractured in two at previous weld.

39) Flange of deck frame 6 between deck longitudinals 5 & 6 is moderately distorted.

40) Bottom frame 6 between bottom longitudinal frames 5 & 6 is moderately distorted.

41) Frame 6 is moderately bowed to 4" between side shell longitudinals 1-5.

42) Between bottom frames 6 & 7 bottom shell plate and bottom longitudinals 3-6 set up 4" to 6".

43) Flange of deck frame 7 is waved and distorted 1-3 inching between deck longitudinal frames 5 & 6.

44) Flange of bottom frame 7 is set up 2" between bottom longitudinal 9 & 10.

45) Between frames 7 & 8 a inset 24x30x3" located between side shell longitudinal 5 and base line.

46) In way of bottom frame 8, bottom longitudinal 4 is fractured in weld.

47) Flange of deck frame 8, is moderately distorted between deck longitudinals 5 & 6.

48) On bottom frame 9 web is inset and distorted in a 30x24x3" area located between bottom longitudinals 11 & 12.

49) Frame 10 is moderately bowed and distorted 1" in way of side shell longitudinal 5.

50) Between frame 9 and bulkhead 11 bottom plate is up set to 12" between longitdinals 6-14.

1 PORT TANK

51) Between bulkhead 3 and frame 4 side shell longitudinals 1-3 and associated shell plate bowed and inset 2". Bulkhead brackets 1, 3 and 4 moderately waved.

52) Frame 4 is heavily inset web buckled 4" between side shell longitudinal 1-5.

53) Between frame 4 and side shell longitudinals 1 & 2 welds fractured.

54) Between frames 4 & 5 side shell lonitudinals 1-3 heavily bowed to 4".

55) Frame 5 at shellplate is heavily distorted in web in way of all shell plate longitudinals.

56) Between frame 5 and shellplate longitudinals 1 & 2, welds to closure plates fractured.

57) Between bottom and side shell frames 5 a inset 2½" deep in a 12" radius.

58) Between frames 5 & 6 side shell longitudinals 1-3 bowed to 5" with associated shellplate inset.

59) Frame 6 at side shell is heavily distorted in web to 6" between side shell longitudinals 1-4. Frame was released in way of side shell longitudinal 4 and not rewelded.

60) Frame 6 at bottom shell is moderately bowed and distorted between bottom longitudinals 1-6.

61) Frame 6 is inset and distorted in a 24" radius 3" deep between bottom longitudinal 1 and side shell.

62) In way of frame 6 bottom shellplate and associated longitudinal upset and distorted to 4" between bottom longitudinals 1-4.

63) Between frames 6 & 7 side shell longitudinals 1-3 heavily bowed. From frame 6 forward to mid length inset to 4" in shellplate.

64) Side shell frame 7 is heavily distorted to 8" from bounding bar to side shell longitudinal 4. Frame 7 was released in way of effected area, but not rewelded.

65) Side shell frame 7 at base line noted with a inset in web of 12x12x1".

66) Between side shell frames 7 & 8, side shell longitudinals 1-3 bowed to 3" with associated shellplate inset.

67) Frame 8 is heavily distorted in web between side shell longitudinals 1-4. Frame was released from shellplate and not rewelded.

68) Web of frame 8 at base line is inset in a 15x12x3" area.

69) Between frames 8 and 9 side shell longitudinals are bowed to 4" with associated shellplate inset.

70) Between frames 9 & 10 side shell longitudinals 1-5 bowed to 2" with associated shellplate inset.

71) Frame 10 is moderately distorted in flange between side shell longitudinals 1-5.

72) Between frame 10 and bulkhead 11 light bowing to side shell longitudinals 1-5.

73) Bulkhead 11 is buckled at side shellplate from bulkhead bracket 2 to base line inset of 3" in a 15" radius.

2 PORT TANK

74) Between bulkhead 11 and frame 12 side shell longitudinals 1-5 moderately bowed with associated shellplate inset to 2" bulkhead brackets 1 & 2 moderately waved.

75) Access ladder is moderately bent and distorted from base line to side shell longitudinal 5.

76) Bulkhead 11 vertical stiffeners 1-14 are tripped from bottom longitudinal up 1 ft. Lower brackets 3-11 waved and distorted.

77) Between bulkhead 11 and frame 12 bottom plate and associated frames are set up 3 to 4" between bottom longitudinals 1-5.

78) Frame 12 is moderately distorted between side shell longitudinals 2-4.

79) Between frames 12 and 13 side shell longitudinals 1-3 are heavily bowed to 3 inches , the width of frame space associated inset to shellplate.

80) Between frames 12 and 13, all bottom longitudinal are moderately bowed and or tripped.

81) Between frames 12 & 13, bounding bar is inset in a 8"x6"x3".

82) Between frames 13 & 14, between side shell longitudinals 1 & 2 a 24x30x4" inset. Associated bowing to longitudinal #1.

83) Between frames 12 & 13 bottom longitudinal 14 is heavily distorted in top flange, inset to 2".

84) Bottom frame 14 is moderately distorted on top flange inset 1" for a 6" length. A 8x10x1" inset noted in web of frame in way of bottom longitudinal #6.

85) Between frame 14 & 15 all bottom longs heavily distorted and set up 4-6".

86) Between frames 15 & 16, side shell is moderately distorted to 2", the width of frame space from deck seam to longitudinal 2.

87) Frame 15 is moderately distorted due to previous repairs in the form of cropping and insert of frame between side shell longitudinals 1-5.

88) Bottom frame 15 is moderately distorted its length.

89) Frame 15 and associated shellplate is moderately waved, set up 2½" at longtiudinal bulkhead, due to release of frame and rewelding.

90) Between frames 17 & 18 bottom frames and shellplate moderate to heavy distortion between bottom longitudinal 8 and longitudinal bulkhead.

91) Frame 17 is inset in web in a 8"x8"x1" area at bottom longitudinal 6.

92) At bulkhead 19 all bottom longitudinal brackets lightly waved and distorted.

93) Between frames 18 and 19 bottom longitudinal 8-14 and associated shellplate are set up 3" to 4".

#2 STARBOARD TANK

94) Between BHD 11 and Frame 12 shellplate longitudinals 1-3 and associated shellplate moderately bowed and distorted 3" to 4".

95) Between frames 12 and 13 all shellplate longitudinals moderately bowed to 3 inches.

96) Between frames 12 & 13 bottom longitudinals 3 thru longitudinal BHD heavily up set to 8".

97) On frame 12 a inset in web 12x12x1½" just below side longitudinal 5.

98) Frame 14 at base line is inset 12"x12"x3".

99) Between frames 14 and 15, bounding bar is inset 24x8x1".

100) On frame 15 a inset 12x12x2" located at base line.

101) Between frames 14 & 15 bottom longitudinals 8 thru the longitudinal bulkhead are heavily distorted and set up to 9".

102) Deck frame 15 is buckled in flange located between frames 5 & 6 at vertical posts 12"x6"x3".

103) Between frames 15 & 16, bounding bar is moderately distorted and inset 4"x36x3".

104) Between frames 15 & 16, bottom longitudinals 8 through longitudinal bulkhead set up to 12"

105) Between frames 16 & 17 bottom longitudinals 1- longitudinal bulkhead heavily distorted to 9".

106) Frame 17 was released and not rewelded in way of bottom longitudinal #4.

107) Between frames 17 and 18 bottom longitudinals 1- longitudinal bulkhead heavily waved and distorted to 10".

108) Between frames 17 and 18 side longitudinals 2 and 3, moderately distorted to 2".

109) Deck frame 18 is distorted in flange inset to 5" in a 12" area located between longitudinals 10 and 11.

110) BHD 19 bottom bracket 1-3 moderately waved.

111) Between frame 18 and BHD 19 all bottom longitudinal upset to 6".

3 PORT TANK

112) Between frames 20 and 21 bottom longitudinal 1-14 moderately bowed, set up 2 to 3 inches.

113) Bottom frame 21 at base line is inset in web 24x18x1½".

114) Bottom frame 24 is inset 25x19x1½" between bottom longitudinals 7 & 8.

115) Bottom frame 25 at base line is inset in web 18x30x3:.

116) Frame 26 at side longitudinal 5 is inset 2" in 30"x18" area.

117) Bottom frame 26 is inset 6x18x2" between bottom longitudinal 5 & 6.

118) Between frame 26 and BHD 27 bottom longitudinal and shellplate is up set 3 to 6" between bottom longitudinal frames 1-10.

119) BHD 19 bottom brackets 1, 3, 4, 8, 9, 10, 11, 13 and 14 moderately waved.

3 STARBOARD TANK

120) Frame 20 is inset 18x6x2" in way of longitudinal #5.

121) Frame 20 is inset in web 30x18x1½ located between base line and bottom longitudinal #1.

122) Between BHD 19 and frame 20 bottom longitudinal 6-10 are set up 3 to 6".

123) Bottom frame 20 is heavily distorted between bottom longitudinal 6-10.

124) Between frames 20 and 21 side shell longitudinal #2 is bowed 3" its length.

125) Frame 21 at base line is inset 18x20x3".

126) Bottom frame 21 at longitudinal bulkhead is upset in web 15x17x2".

127) On frame 21, vertical post is lightly distorted at mid height, located between bottom longitudinals 5 and 6.

128) Frame 22 at base line is inset in web 15x15x4".

129) Frame 24 was tripped released and rewelded, moderately waved and distorted its length.

130) Frame 24 is inset 2" in a 6" area between deck longitudinal 5 & 6.

131) Frame 24 bottom, diagonal is moderately waved at mid height.

132) Between frames 24 & 25 side shell longitudinal 2 & 3 moderately bowed to 3".

133) Frame 25 at base line is inset in web 18x20x3".

134) Bottom frame 25 is upset 2" in way of bottom longitudinals 7-9.

135) Frame 26 at base line is inset in web 15x10x2".

136) Between frames 25 and 26 all longitudinals are up set 3 to 6".

137) Frame 26 is upset 2" for a six inch length located between deck longitudinals 5 & 6.

138) BHD 27 bottom brackets 1-10 moderately distorted. Bottom longitudinals 1 & 2 tripped.

STERN RAKE PORT

139) BHD 27, bottom brackets 12 & 14 moderately waved. Bottom longitudinal #1 tripped at BHD bracket.

140) BHD 27 vertical BHD stifferer 1 and 2 tripped at brackets.

141) Between vertical stern log frames 6 & 7 a inset in shellplate 20x15x2".

142) Tranverse stern log frame is inset 1" in a 12" area located between vertical stern log frame 6 & 7.

143) Between frame 29 and aft vertical bracket, side shell longitudinal #1 is moderately distorted 2".

144) Between stern log and first forward vertical bracket at side shell, a inset 4 feet x 30" x 3".

145) Between corner wrap and vertical side shell bracket 2, deck longitudinal #1 is fractured, 2 welds.

STERN RAKE STARBOARD

146) BHD 27 stiffener #2, tripped at bottom bracket, bracket moderately distorted.

147) BHD 27 bottom brackets 5, 7, 8, 9, 11 and C.V.K. moderately waved

148) AFT of frame 28, between side shell brackets 1 & 2 a inset 28x12x1½.

149) AFT of frame 28 between side shell brackets 2 & 3 a inset 24x12x1".

150) AFT of frame 29 above first vertical side shell bracket a inset 3 feet x 10" x 3" deep from bounding bar to rake knuckle, #1 side longitudinal in way of this area is bowed 3".

151) Between vertical bracket 1 & 2 as counted forward from stern log a inset 30x30x2½.

152) Stern corner wrap is inset 24"x20"x2½" with associated inset to shellplate and bracket.

153) On stern log between corner wrap and first vertical stern log frame a inset 16"x18"x2".

154) On stern log between vertical stern log frame 4 & 5 a inset 30x20x4".

155) On stern log in way of vertical stern log frame 10 a sharp inset of 1½" in a 4" radius.

156) On stern log between vertical stern log frames 4 & 5 a inset of 1½" in a 4" radius.

DECK

Exterior deck was surveyed for obvious inset and depression. Old weld beads, clips and stanchions supporting the wapama vessel noted on deck. Much of the starboard side could not be surveyed due to winches, spars and standing rigging from the wapama vessel on deck. Strakes are designated A-D port and starboard with the middle strake of the barge designated the center strakes. Strakes are lettered in the customary manner inboard from center strake A-D. No deflections or insets less than 1" were recorded.

DECK PORT SIDE

157) On A strake between 50 and 60 feet from bow a inset 7'x 8'x1".

158) Between A, B and 3 feet into C strakes, located between 75 to 130 feet from bow a the deck is waved and distorted in a 55'x20'x4".

DECK STARBOARD SIDE

159) On B strake, 85 feet from bow a depression 7'x4'x2".

160) On A and B strakes located 100 to 125 feet from bow the deck is upset 25'x15'x6".

NON DESTRUCTIVE TESTING

Shellplate was surveyed for thickness internally using a Crout Kramer Bransen Model # CL 202 digital ultra sonic gauge. Much of the bottom plate could not be tested due to mud and silt in the tank bottom . It was our opinion that wastage if any would in general be most extreme in the wind and water strake areas of the interiors. Shots were taken at random with the following results. From data submitted to this office original construction of shellplate is ½". The following results are given in decimal equivalents:

BOW RAKE STARBOARD

161) Between frames 1 & 2 located between bottom longitudinals 8 & 9 .487 .472.

162) Between frames 1 & 2 located between side longitudinal 3 and 4, .464.

163) Between frames 1 & 2 located on rake knuckle, .483.

BOW RAKE PORT

164) Between BHD 3 and frame 2 located between side longitudinals 3 & 4, .455.

165) Between BHD 3 and frames 2 located between side longitudinals 2 and 3, .426.

166) On BHD 3 between BHD stiffener 1 & 2 12" from bottom plate, .342.

167) Between head log and frame 1 located between bottom longitudinals 4 & 5, .493-.473.

STARBOARD #1 TANK

168) Between frames 5 & 6 located between bottom longitudinals 4 & 5, .470.

169) Between frames 5 & 6 between side longitudinals 4 & 5 .452.

170) Between frames 8 and 9 located between bottom longitudinal frames 3 and 4, .454.

171) Between BHD 11 and frame 12 located between side longitudinal 3 and 4, .463-.449 -.463-.468 -.467-.464.

PORT 1 TANK

172) Between BHD 11 and frame 10 located between side longitudinals 3 and 4, .468 .475.

173) Between frames 7 & 8 located between side longitudinals 3 and 4, .439 .472.

174) On BHD 3 between bottom longitudinals 12 and 13, 3½ feet from bottom plate, .379.

STARBOARD #2

175) Between frames 13 & 14 located between side longitudinals 3 & 4, .455. Between side longitudinals 4 & 5, .469.

176) Between frames 16 & 17 located between bottom longitudinals 1 & 2, .477. Between longitudinals 10 & 11, .500.

2 PORT TANK

177) Between BHD 11 and Frame 12 located between side longitudinals 3 and 4, .439 .432 .459.

178) Between frames 14 and 15 located between side longitudinals 3 and 4, .463 .459.

179) On BHD 2 feet from bottom between vertical stiffeners 8 & 9 .390.

3 STBD TANK

180) Between BHD 19 and frame 20 located between side longitudinals 3 and 4, .456 .423.

181) On BHD 19 between vertical stiffeners 6 & 7 located 15 inches from bottom, .369.

3 PORT TANK

182) Between BHD 19 and frame 20 located between side longitudinals 3 and 4, .440 .463 .459. Between side longitudinal 4 and 5, .473.

183) Between BHD 19 and frame 20 located between bottom longitudinals 7 & 8, .472.

184) Between frames 22 & 23 located between side longitudinals 3 and 4, .440 .442.

185) Between frames 25 and 26 located between side longitudinals 4 & 5, .459. Between side longitudinals 3 and 4, .470

186) Between frames 20 & 21 located between bottom longitudinals 9 & 10, .486.

STBD STERN RAKE

187) Between BHD 27 abd frame 28 located between C.V.K. and bottom longitudinal 14, .448.

188) Between frame 29 and stern log located between bottom longitudinal 7 & 8, .476.

189) Between frame 29 and stern log on 4 inches below bottom plate on rake knuckle, .481.

190) On BHD 27 between BHD stifferers 2 & 3 located 4 feet from bottom, .376.

191) Between BHD 27 and frame 28 located between side longitudinals 2 & 3, .473.

PORT STERN RAKE

192) On BHD 27 between BHD stiffeners 2 & 3 located 12" from bottom .356.

193) Between frames 28 and 29 located between bottom longitudinal frames 3 & 4, .455.

AIR TESTING

The undersigned was present on 6-26-85 and subsequent dates to witness the static test for tightness at 3 PSI for 30 mintues. The exterior BHDS and sealed hatches were inspected continuously during testing with soapy water to determine leaks. All tanks were found to be tight.

DISCUSSION

General condition of the barge is considered fair. As is generally known, this vessel grounded in Alaska in 1977 with substantial bottom damage, deflection to deck, internals and general rack and distortion. From drafts taken manually there also appears to be a hog of approximately 8" also felt to be due to the event. In order to comply with your general outline of providing an A.B.S. quality specification for renewal and to bring this vessel back to a

classification condition, it would be necessary to totally remove the bottom plate and internals of tanks 2 & 3 port and starboard. Extensive repairs would also be required to the side shell plate and longitudinal bulkhead.

Present vessel condition as found in this report of survey indicates that most shell plate distortion due to the event was left as is. Damaged frame work was removed and new frames and bulkhead sections were added, scribed to fit the contours of the distorted shell plate.

In our opinion it is not economically feasible to repair this vessel to classification condition since the cost of such repairs would exceed the vessel value. Further, intricate engineering of supports would have to be designed to support the Wapama on deck while bottom, internal and shell plate renewals are accomplished.

There are some deficienies found during their survey which could be economically repaired and renewed both in dry dock and afloat. It is therefore, our opinion that the vessel is in suitable condition as a dry berth and within limitations as a work platform for renovation of the Wapama. This would be subject to dry docking, further ultra sound gauging of the bottom plate from the exterior and compliance with recommendation which would be pending your decision with regard to extent of repairs.

The above report is a statement of opinion, made, signed and submitted without prejudice to the rights and/or interests of whom it may concern.

Respectfully submitted,

Bruce Cibley
Marine Surveyor

BC/kc

H30 (WR-GOGA)

September 6, 1985

Mr. Bruce Sibley
Hull & Cargo Surveyors
253 Tewksbury Avenue
Richmond, California 94801

Dear Bruce:

I apologize for taking so long in responding to your questions about the survey and stability reports you submitted on Barge 214. As I said on the phone last week, I finally am at the point where I can begin catching up on important matters. Thank you for the extra work you and Bob did when rushing to meet our deadline. The offices which required the information have proceeded, thanks to your help.

In reviewing the specifications I have identified some questions which were left unanswered by the reports:

1. In the 160 notes the condition of the barge, welds are mentioned only 5 times despite the extensive distortions found. Does this indicate that the welds throughout were found to be in good condition and not a factor to be considered in assessing the integrity of the barge?

2. No mention of the longitudinal integrity of the barge was presented in either of the reports received. Is it your intent to present the "... analysis of the longitudinal integrity of the barge shall ... and the measures necessary to correct ...." in a later report?

3. Have you had the opportunity to assemble the photographs of deficiencies required in the preliminary report yet?

4. We have yet to determine what repairs ABS will require to certify the barge for its' new intended use (ie., ship display). I am optimistic that the requirements will be minimal. In preparation of your assessment that "... it is not economically feasible to repair this vessel ... since the cost of repairs would exceed the vessel value." did you prepare repair estimates or determine the barge valuation? If so, are copies of this documentation available?

I have forwarded your invoice to purchasing for processing. You should receive payment within 6 weeks or so. I will be out of town from September 9 through 20. Should you have any questions please contact Tom McGrath through our unit office at 556-3002.

Thanks again for your help.

Sincerely,

Stephen W. Hastings
Marine Maintenance Foreman

HULL AND CARGO SURVEYORS, INC.
MARINE SURVEYORS AND CONSULTANTS
253 TEWKSBURY AVENUE, RICHMOND, CALIFORNIA 94801
TWX NO. 9103826002, ANS BK HCSI SFO RCMD
TEL. (415) 524-4402

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ST. LOUIS
SAN JUAN, P.R.

October 18, 1985

UNITED STATES DEPARTMENT OF THE INTERIOR
National Park Service
GGNRA
Ft. Mason
San Francisco, CA 94123

Attn: Mr. Stephen W. Hastings
Marine Maintenance Foreman

RE: Your Ref: H30 (WR-GOGA)
Our Ref: SFH 85129

Dear Steve:

In reply to your questions in the referenced letter, as we have discussed by phone:

1) While welds are not necessarily in good condition, we have noted them in the areas which might create a problem. Those individual locations should certainly be considered but welds form a small percentage of the evaluation factors.

2) We attach to this letter a printout of what is considered to be a conservative evaluation of longitudinal strength. Obviously Barge does not comply with requirements for offshore use but is considered satisfactory for moored operation.

3) Attached are photos of representative conditions.

4) We understand Mr. Z. Reynolds is working with ABS. We have not prepared estimates since our base would have to be repairs to original condition. If this is not to be the base, we would have to know the extent of repairs considered satisfactory to all parties.

Very truly yours,

R. A. Wehnau
Technical Manager

RAW/mab
Attachments

HULL & CARGO SURVEYORS, INC.

BARGE 214

XEQ "IX"

SCANTLINGS

1
AREA
360.00 RUN
QTY.
1.00 RUN
LEVER TO BASE
12.00 RUN
VERT. PLATE?
HEIGHT FT.
0.00 RUN

2
AREA
1.00 CLX
72.00 RUN
QTY.
2.00 RUN
LEVER TO BASE
6.00 RUN
VERT. PLATE?
HEIGHT FT.
12.00 RUN

3
AREA
54.00 RUN
QTY.
1.00 RUN
LEVER TO BASE
6.00 RUN
VERT. PLATE?
HEIGHT FT.
12.00 RUN

4
AREA
3.5625 RUN
QTY.
28.00 RUN
LEVER TO BASE
11.75 RUN
VERT. PLATE?
HEIGHT FT.
0.00 RUN

5
AREA
3.5625 RUN
QTY.
10.00 RUN
LEVER TO BASE
6.00 RUN
VERT. PLATE?
HEIGHT FT.
0.00 RUN

6
AREA
39.00 RUN
QTY.
RUN
LEVER
VERT. PLATE?
HEIGHT FT.
0.00 RUN

7
AREA
3.5625 RUN
QTY.
6.00 RUN
LEVER TO BASE
.25 RUN
PLATE?
FT.
0.00 RUN

8
AREA
0.00 RUN

N.A. 8.70

MOM. OF INT.
16345.28 ***
DEPTH
12.00 RUN
SM TO DECK
4958.67 IN2 FT
SM TO BASE
.97 IN2 FT

HULL & CARGO SURVEYORS, INC.

	BEND. MOM. + STRESS	DEFLECTIONS
0.		0.00 INCHES
1.	-1,646. F/T -1,753. PSI	0.22 INCHES
2.	-2,765. F/T -2,944. PSI	0.43 INCHES
3.	-3,322. F/T -3,538. PSI	0.62 INCHES
4.	-3,674. F/T -3,912. PSI	0.80 INCHES
5.	-4,049. F/T -4,313. PSI	0.97 INCHES
6.	-4,450. F/T -4,739. PSI	1.11 INCHES
7.	-4,874. F/T -5,191. PSI	1.23 INCHES
8.	-5,323. F/T -5,669. PSI	1.33 INCHES
9.	-5,796. F/T -6,172. PSI	1.40 INCHES
10.	-6,293. F/T -6,702. PSI	1.44 INCHES
11.	-6,815. F/T -7,258. PSI	1.45 INCHES
12.	-7,361. F/T -7,839. PSI	1.43 INCHES
13.	-7,931. F/T -8,446. PSI	1.37 INCHES
14.	-8,191. F/T -8,723. PSI	1.28 INCHES
15.	-7,864. F/T -8,375. PSI	1.14 INCHES
16.	-7,043. F/T -7,500. PSI	0.97 INCHES
17.	-5,830. F/T -6,209. PSI	0.76 INCHES
18.	-4,377. F/T -4,661. PSI	0.52 INCHES
19.	-2,497. F/T -2,659. PSI	0.27 INCHES
20.	0. F/T 2.E-5 PSI	0.00 INCHES

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RUN
S/T-FT
DISP.= 1,860.00
RUN
TRIM= 0.00
RUN
DRAFT= 5.65
RUN
SECT. MOD. DECK
4,959.00 RUN
BOTTOM=
1,878.00 RUN
MOM. OF I.=
16,345.00 RUN
RAKE SPACES
2.00 RUN
MID SPACES
16.00 RUN
RAKE SPACING
10.00 RUN
MID SPACING
10.00 RUN
LENGTH
200.00 RUN

LOAD 1. S.T.
53.00 RUN
LOAD 2. S.T.
85.00 RUN
LOAD 3. S.T.
127.00 RUN
LOAD 4. S.T.
81.00 RUN
LOAD 5. S.T.
81.00 RUN
LOAD 6. S.T.
81.00 RUN
LOAD 7. S.T.
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LOAD 11. S.T.
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LOAD 12. S.T.
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LOAD 13. S.T.
81.00 RUN
LOAD 14. S.T.
148.00 RUN
LOAD 15. S.T.
136.00 RUN
LOAD 16. S.T.
130.00 RUN
LOAD 17. S.T.
115.00 RUN
LOAD 18. S.T.
100.00 RUN
LOAD 19. S.T.
85.00 RUN
LOAD 20. S.T.
71.00 RUN

SHEAR 0. 0.0 S.T.

SHEAR 1. 36.7 S.T.

SHEAR 2. 105.4 S.T.

SHEAR 3. 149.0 S.T.

SHEAR 4. 146.6 S.T.

SHEAR 5. 144.1 S.T.

SHEAR 6. 141.7 S.T.

SHEAR 7. 139.3 S.T.

SHEAR 8. 136.9 S.T.

SHEAR 9. 134.4 S.T.

SHEAR 10. 132.0 S.T.

SHEAR 11. 129.6 S.T.

SHEAR 12. 127.1 S.T.

SHEAR 13. 124.7 S.T.

SHEAR 14. 189.3 S.T.

SHEAR 15. 241.9 S.T.

SHEAR 16. 288.4 S.T.

SHEAR 17. 320.0 S.T.

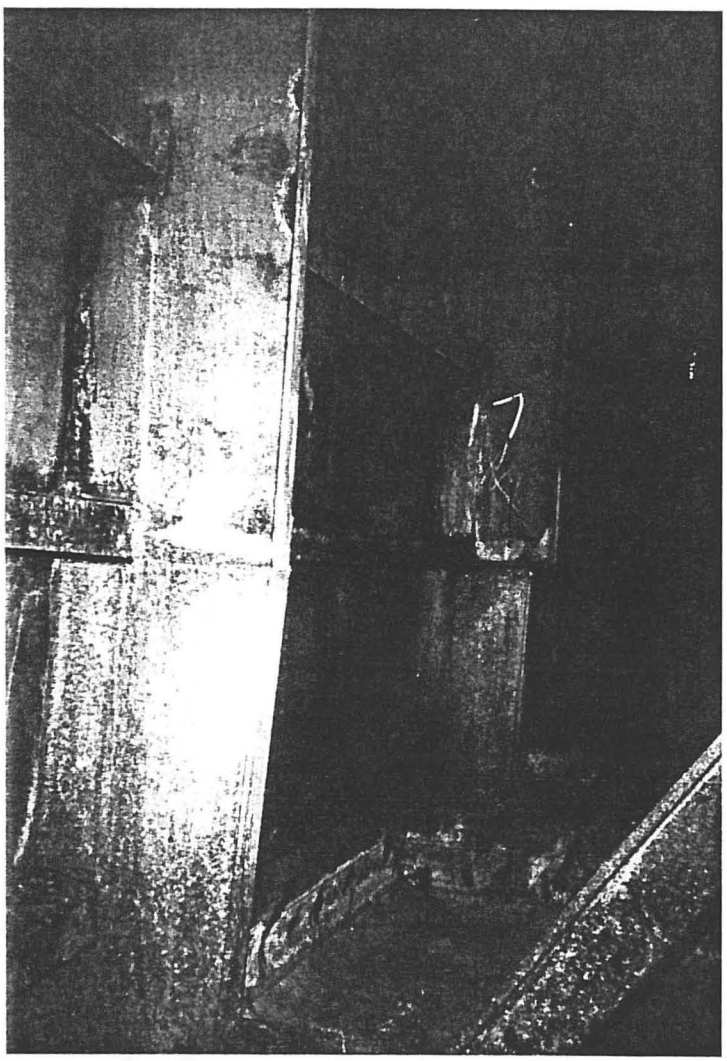
SHEAR 18. 336.6 S.T.

SHEAR 19. 405.3 S.T.

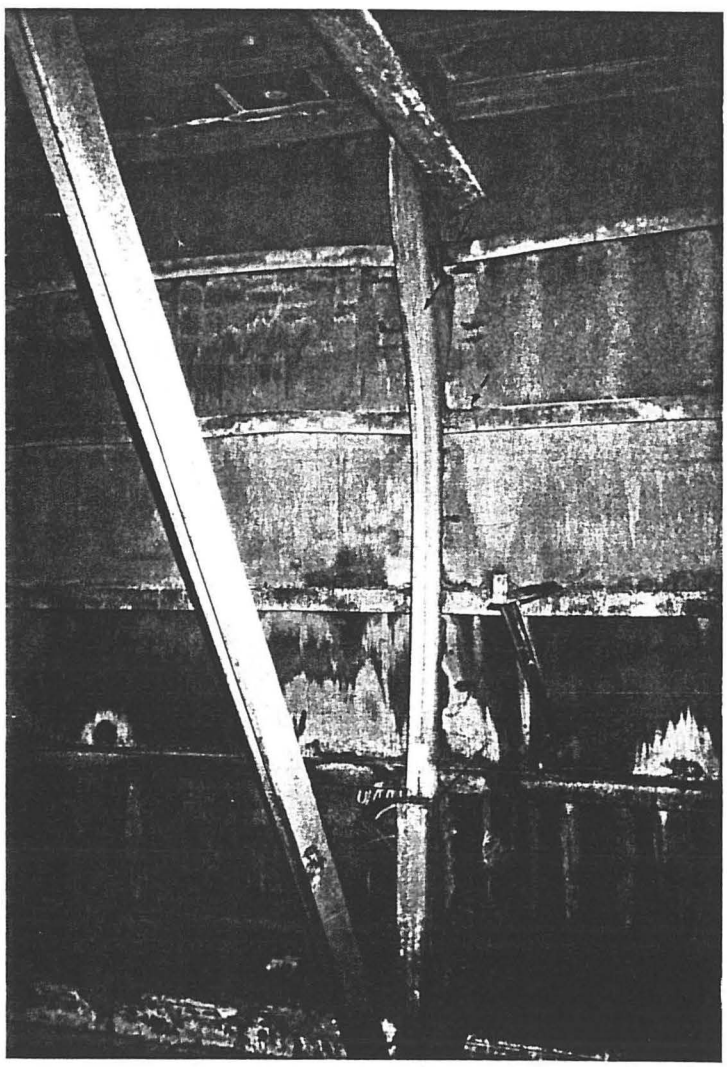
SHEAR 20. 460.0 S.T.

HULL & CARGO SURVEYORS, INC.

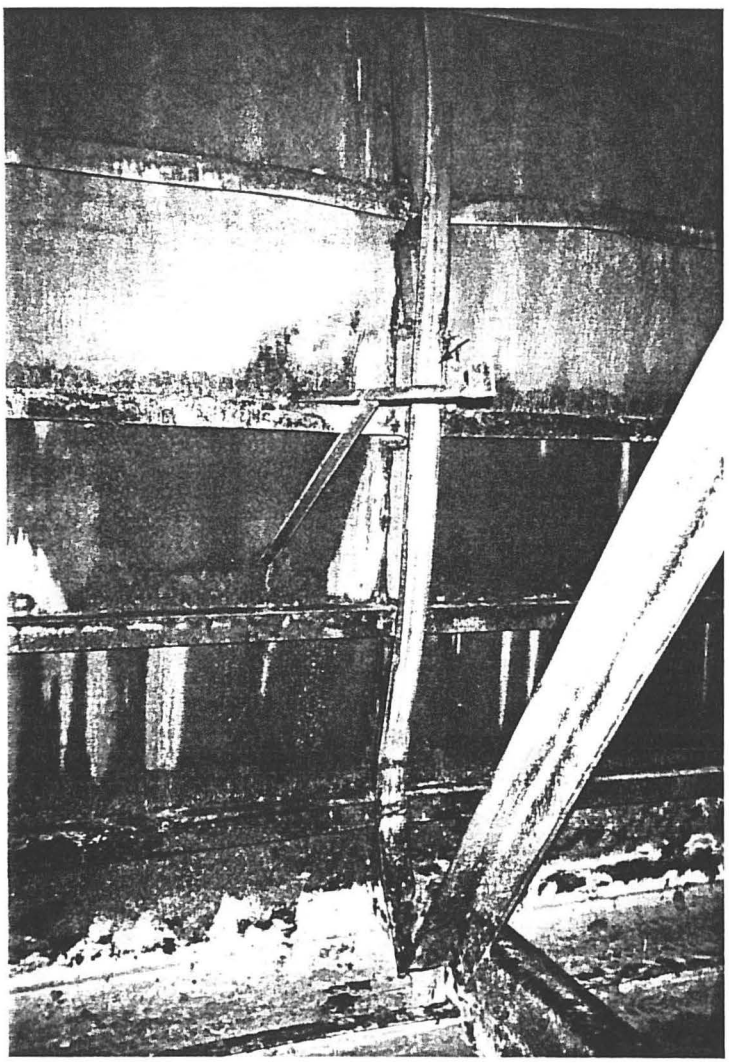
SFH 85129
Page 1,
Photo #1,
Frames not welded completely.



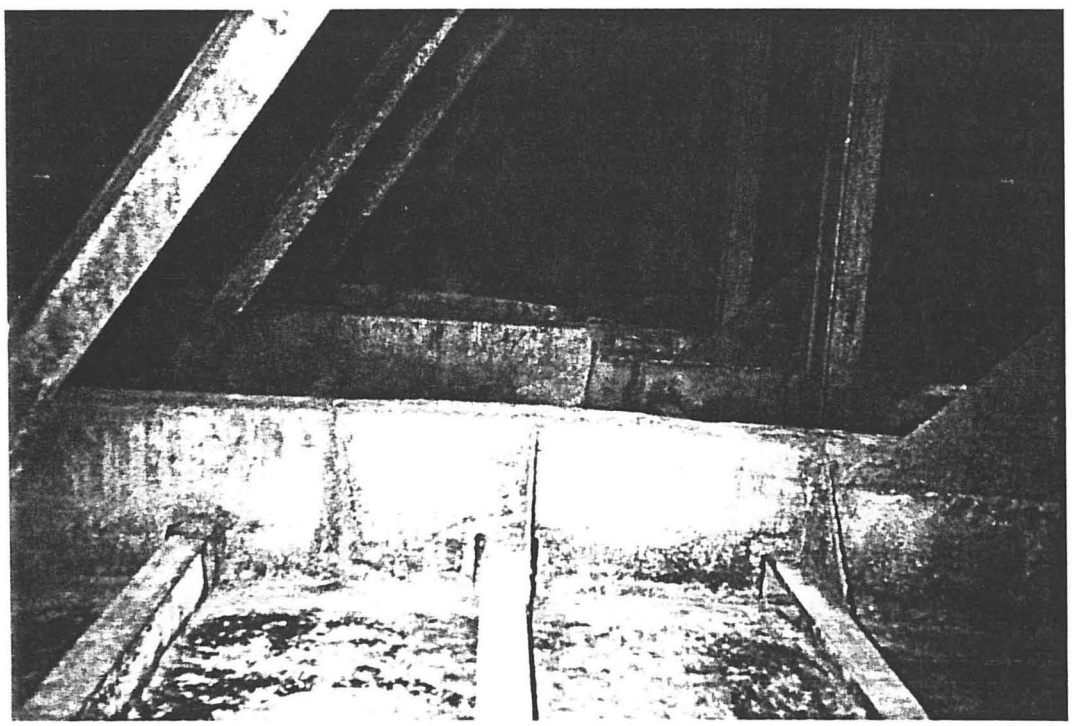
SFH 85129
Page 2
PHoto #2
Upper: Bemt fra,e re;eased amd reset.
Middle: Deflection in longitudinals
Lower: Frame not rewelded



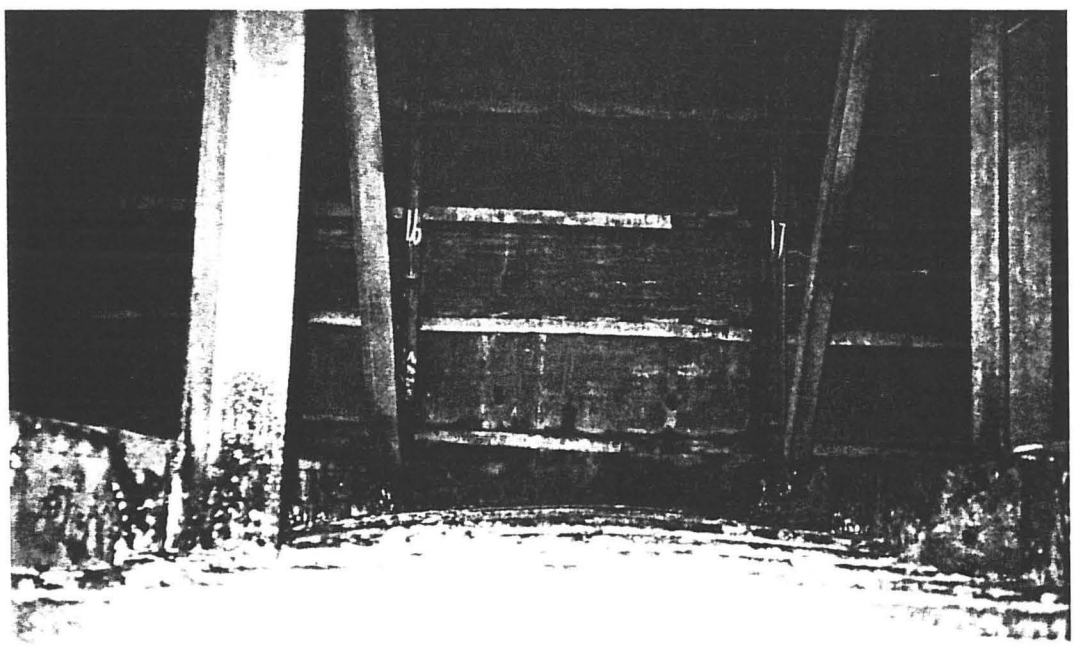
SFH 85129
Page 3,
Photo #3,
Frame scribed to fit distorted shell plate.



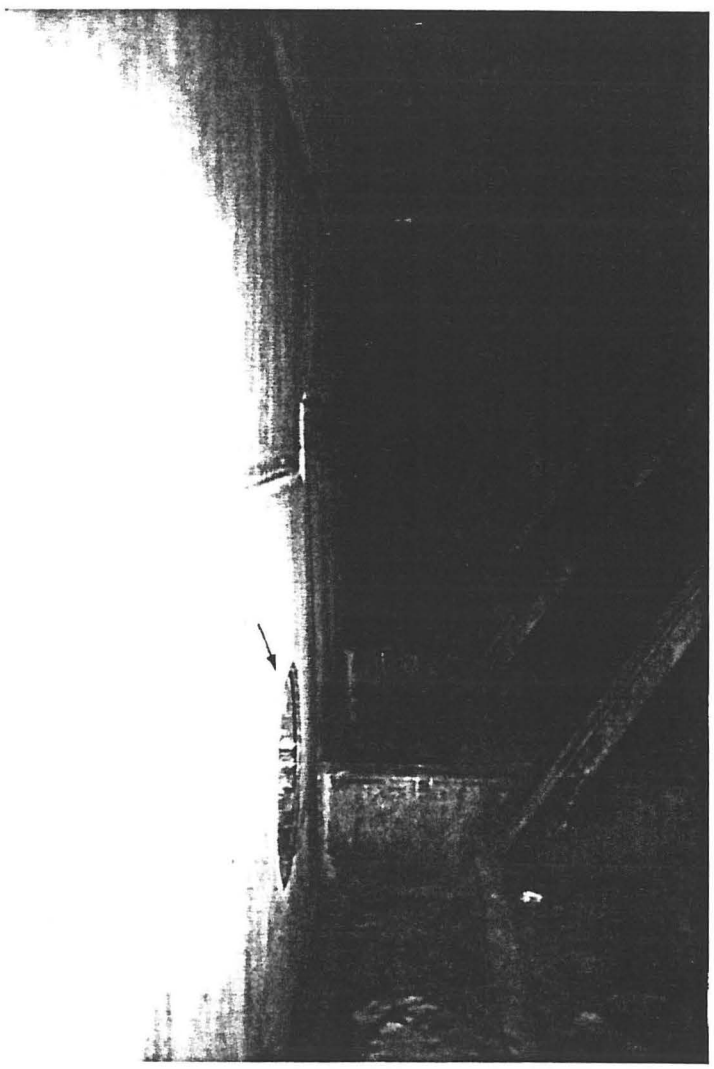
SFH 85129
Page 4
Photo #4,
Distortion in bottom frames, scribed to fit.



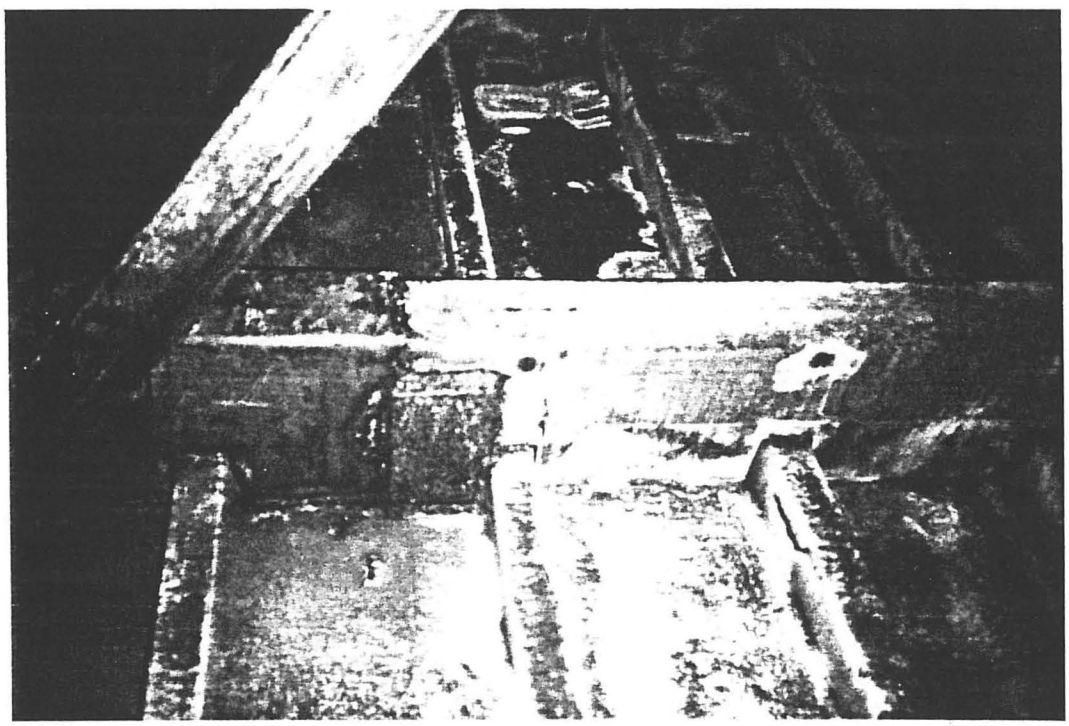
SFH 85129
Page 5
Photo #5,
Bottom distortion, frames scribed to fit.



SFH 85129
Page 6
Photo #6,
Longitudinal bulkhead with BHD access.



SFH 85129
Page 7
Photo #7,
Side shell with frame scribed to fit.



SFH 85129
Page 8
Photo #8,
Bottom frame distortion, side shell frames scribed to fit

SFH 85129
Page 9
Photo #9,
Deck upset port side.